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Detecting and Quantifying OAE Signal and Associated Carbon Removal in the Bedford Basin Field Trials

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Ocean Alkalinity Enhancement (OAE) is one promising tool in a portfolio of mCDR methods to deal with the residual anthropogenic CO_2 burden in the atmosphere. Mimicking the natural process of rock weathering, OAE has the potential to remove CO_2 from the atmosphere and store it in seawater in the dissolved and thermodynamically stable form, therefore ensuring the durability of such removal. Field trials and mesocosm studies are needed to investigate the efficiency and durability, environmental safety, and Monitoring, Reporting, and Verification (MRV) requirements of OAE.

In Summer-Fall 2023, a series of OAE field trials were conducted in Bedford Basin (Canada) aimed at examining the distribution of the alkalinity signal resulting from the OAE release and quantifying associated carbon removal using an MRV framework that combines direct field observation and regional-scale data-assimilative modelling.

During the trials, Dalhousie's industry partner, Planetary Technologies, released 278 T of brucite over two months, starting in October 2023. The brucite release was preceded by a Rhodamine dye tracer release and a combined dye-alkalinity release to better understand local water circulation and dispersion and to test measurement/modelling techniques.

Making use of an extensive dataset from the moored and profiling assets, ship-tethered sensor packages, aerial surveillance and water samples collected during the trials, we will demonstrate the detectability of the OAE signal at this site, and describe our approach to constraining and quantifying the near-field distribution of alkalinity feedstock. We will further examine the carbon removal associated with the release in the observation and models, with implications for designing an optimal MRV framework for the Bedford Basin test site.